Working Paper Number 12

The Terms of Trade Facing South Korea with Respect to Its Trade with LDCs and DMEs

Kersti Berge and Trevor Crowe*

This paper examines the terms of trade for South Korea's trade in manufactures with developed and developing countries separately, using primary data for the construction of indices which cover the period 1976-95. During this period, there was no significant trend in South Korea's net barter terms of trade with developed market economies. However, income terms of trade rose, suggesting that South Korea has increased the volumes of her manufactured exports to DMEs without experiencing a fall in their relative price. With regard to trade in manufactures with developing countries , the paper finds a significant increase in South Korea's net barter terms of trade in manufactures and an even greater increase in the income terms of trade. In this case South Korea has seen a relative increase in prices at the same time as she has been able to increase the volume of manufactured exports to developing countries.

August 1997

* Queen Elizabeth House, University of Oxford

Introduction

This study

The aim of this study is to examine, using primary source trade data, the trends in the terms of trade facing South Korea with respect to its trade with less developed countries (LDCs) and developed market economies (DMEs).

Contents

The study consists of three major parts. Part I considers the trade data used, the methodology used to turn this information into an appropriate data set, and the methodology used to obtain terms of trade indices from this data set. Part II considers South Korea's terms of trade with developing countries and part III considers South Korea's terms of trade with developed market economies. Parts II and III are each further subdivided into 3 sections. The first section outlines the pattern of trade between South Korea and the country group in question. The second section considers the indices obtained and the value of trade that they represent. The third section describes the methodology used to analyse these indices, the results of the analysis, and some interpretation of the results obtained.

Part II, which examines South Korea's terms of trade with LDCs, includes an examination of both the total terms of trade and the manufactures terms of trade, as well as the terms of trade facing South Korea with respect to its export of manufactures to LDCs in return for its imports of commodities from LDCs. The total income terms of trade facing South Korea with respect to its trade with LDCs and DMEs were also examined.

Part III, which examines South Korea's terms of trade with DMEs, considers only the terms of trade (income terms of trade and net barter terms of trade) for manufactures, since virtually all of South Korea's trade with DMEs is in manufactures.

Part I. Data Description and Methodology

Data

In order to construct indices for the terms of trade for South Korean trade with LDCs, data were obtained from the UN COMTRADE database. The data obtained provided information on value and quantity of trade between South Korea and LDCs and DMEs (South Korean exports and imports) for the years 1976-1995, at the 1-digit, 4-digit and 5-digit levels of SITC Rev. 2. The major problem with the data obtained, however, was the omission of observations for quantity of trade and/or value of trade in many instances. Given that, in order to construct terms of trade indices, unit value (value of

trade divided by quantity) measurements would need to be calculated, such missing observations necessitated a lengthy methodology to establish a complete data set of value, quantity and unit value observations. Another problem with the data concerns the appropriateness (or otherwise) of the quantity unit (tonnes) which clearly does not apply to computers, for example. However, given that the data are in this format unit values are computed as value per tonne for all items, and the limitations of this measurement should consequently be borne in mind when making inferences from the data.

Methodology used to obtain full data set

The aim of the methodology described here is to transform the data from the COMTRADE database into a data set which has a complete set of value, quantity and unit value observations for each SITC heading included. With respect to the SITC categories the indices were built up from 4-digit and 5-digit categories. Data at a 3-digit level were not used, whilst the 1-digit level data were used for the purpose of calculating the overall value coverage of eventual indices (there existed no quantity data at the 1-digit level). With respect to the 4-digit and 5-digit level data, the data set was built up to include 5-digit categories and then 4-digit categories where disaggregation on the COMTRADE database does not extend as far as 5-digit categories.

Therefore our original (incomplete) data set covered a number of 5-digit and 4-digit categories, providing information on value and quantity of trade where observations were not missing. Each category (4-digit or 5-digit) thus had a series for value and quantity running from 1976-1995 which might include any number of missing observations in both cases.

Step 1 of the process was to calculate a third series for each category to represent unit value (value divided by quantity). Of course, a unit value observation could be calculated only where there existed observations for value and quantity. If one or both of these observations was missing then the unit value observation was left missing.

Step 2 was to count the number of observations in each unit value series. If a unit value series was found to have less than 15 (out of 20) observations, then the category in question was removed from the data set.

Step 3 involved the use of a computer programme written for Time Series Processor (TSP). The output of this programme was a set of unit value series containing the complete set of observations 1976-1995. This output was achieved by fitting the unit value series remaining after Step 2 to four different types of trend or pattern. The unit value series, taking into account any missing observations, were fitted to a simple trend, an exponential trend, a quadratic trend, and a constant pattern. If a unit value series did not fit any of these trends or patterns significantly, then the relevant category was removed from the data set. Otherwise, the programme calculated which trend or pattern was the best fit. If the unit value series from Step 2 had any missing observations, then they were filled in by estimation from the best-fitting trend or

pattern. Thus, a data set was obtained for a number of categories for which each unit value series was complete.

Step 4 subsequently enabled us to complete some of the other missing observations still present in the data set obtained from Step 3. In the cases where, for a given year and category, only the quantity observation was still missing, it was estimated by dividing the value observation by the newly estimated unit value observation. Thus the data set became more complete, the observations only missing for quantity where value was also missing (where value had originally been missing quantity had always also been originally missing).

Step 5 assessed the more complete data set resulting from Step 4. Clearly there remained a problem where value observations were still missing. In these cases, the number of value observations in each value series was counted. Where the number counted was less than 18, the category in question was removed from the data set.

Step 6 took the data set remaining from Step 5 and again used a programme for TSP to fill in missing values. In this case the output consisted of a set of complete value series 1976-1995 for those value series incomplete after Step 5. Again the programme, taking into account any missing value observations, fitted the value series in question to a simple trend, an exponential trend, a quadratic trend, and a constant pattern. If a value series did not fit any of these trends or patterns significantly, then the relevant category was removed from the data set. Otherwise, the programme calculated which trend or pattern was the best fit. Any missing value observations were filled in accordance to estimation by the best-fitting trend or pattern. Thus, given the output of this programme, a data set was obtained for a number of categories for which each unit value and value series was complete.

Step 7 completed the process. The remaining missing quantity observations in the data set remaining from Step 6 were estimated (by dividing value by unit value) from the complete set of value and unit value observations.

The result of this methodology is a data set for a group of SITC categories in which existed a full set of value, quantity and unit value observations across the sample 1976-1995. The methodology implies that a certain proportion of the actual trade flow is not covered by our indices. With respect to South Korea's trade in manufactures with LDCs, 39% of exports and 62% of imports are not covered. For South Korean trade in manufactures with DMEs 31% of exports and 41% of imports are not covered by the indices.

Methodology used to obtain indices

Having obtained the complete data sets from the methodology outlined above, it was a relatively easy task to construct unit value indices for various 1-digit SITC sections or aggregations thereof, and thus also for various terms of trade indices.

Unit value indices, either for SITC 1-digit categories or for higher levels of aggregation (e.g. manufactures, commodities) were constructed as follows.

For each 5-digit or 4-digit heading in the data set, the current value for each year is equal to the unit value (uv) multiplied by quantity (q) in the current period (t),

$$\text{current value}_t = uv_t q_t \ .$$

For each 5-digit or 4-digit category in the data set two 'cross values' were also calculated for each year 1977-1995. The first is equal to unit value in the previous period multiplied by quantity in the current period,

$$\text{cross value } A_t = uv_{t-1} q_t \ .$$

The second is equal to unit value in the current period multiplied by quantity in the previous period,

$$\text{cross value } B_t = uv_t \, q_{t-1} \ .$$

In addition a lagged value was calculated for each 5-digit or 4-digit heading in the data set for each year 1977-1995. This is equal to unit value in the previous period multiplied by quantity in the previous period,

$$\text{lagged value}_t = uv_{t-1} q_{t-1} \ .$$

In order to calculate a unit value index for a certain SITC group or aggregation, the current values, cross values and lagged values for each category in that group or aggregation were summed for each year (current values across 1976-95, and cross values and lagged values across 1977-1995). A link figure was then calculated for each year (1977-1995) for that group or aggregation as illustrated below.

$$\text{link figure}_t = \sqrt{\left[\left(\Sigma uv_t q_t / \Sigma uv_{t-1} q_t \right) . \left(\Sigma uv_t q_{t-1} / \Sigma uv_{t-1} q_{t-1} \right) \right]}$$

which can also be expressed as,

$$\text{link figure}_t = \text{square root} \left[\left(\Sigma \text{ current value}_t / \Sigma \text{ cross value } A_t \right) \times \left(\Sigma \text{ cross value } B_t / \Sigma \text{ lagged value}_t \right) \right]$$

or

$$\text{link figure}_t = \text{geometric mean} \left[\left(\Sigma \text{ current value}_t / \Sigma \text{ cross value } A_t \right), \left(\Sigma \text{ cross value } B_t / \Sigma \text{ lagged value}_t \right) \right]$$

The use of this figure, which indicates the construction of a Fisher chain index, links each actual index figure to that of the year before, giving the factor by which the current year index value will be greater than that of the previous year.

Therefore, the unit value index can be calculated for each year (1976-1995) as follows. By setting the unit value index at 100 in 1980, the unit value index for 1981 can be found by multiplying 100 by the link figure for 1981,

$$\text{unit value index}_{1981} = 100 \times \text{link figure}_{1981} \ .$$

Unit value indices for subsequent years up to 1995 can be found by multiplying the unit value index of the previous year by the link figure for the current year,

$$\text{unit value index}_t = \text{unit value index}_{t-1} \times \text{link figure}_t$$

Unit value indices for years previous to 1980 can be calculated as follows. The unit value index for 1979 can be found by dividing 100 by the link figure for 1980,

$$\text{unit value index}_{1979} = 100 / \text{link figure}_{1980} \ .$$

Unit value indices for previous years back to 1976 can thus be found by dividing the unit value index of the subsequent year by the link figure of the subsequent year,

$$\text{unit value index}_t = \text{unit value index}_{t+1} / \text{link figure}_{t+1} \ .$$

In this way a unit value index can be calculated for exports or imports in any SITC group or aggregation.

In turn, terms of trade indices (denoted as tti) can be calculated by dividing export unit value indices by import unit value indices. For instance, the total terms of trade index

facing a country can be calculated by dividing the unit value index (uvi) for total exports by the unit value index for total imports and multiplying by 100,

$$tti(total)_t = [uvi(exports)_t / uvi(imports)_t] \times 100.$$

Equally, the manufactures-commodities terms of trade index facing a country can be calculated by dividing the unit value index for manufactures exports by the unit value index for commodities imports and multiplying by 100,

$$tti(manufactures\text{-}commodities)_t = [uvi(manufactures\ exports)_t / uvi(commodities\ imports)_t] \times 100.$$

In addition, income terms of trade indices can be calculated by multiplying the terms of trade indices by export volume indices, in turn obtained by dividing value indices by unit value indices. Thus, firstly a value index for exports is constructed by taking the total value of exports, setting 1980=100, and then setting the value index (vali) for each year relative to that,

$$vali(exports)_t = [value(exports)_t / value(exports)_{1980}] \times 100.$$

Subsequently, an export volume index (voli) is constructed by dividing the value index above by the previously obtained unit value index, and then multiplying by 100,

$$voli(exports)_t = [vali_t / uvi_t] \times 100.$$

In order to obtain the income terms of trade index (itti), the previously obtained terms of trade index is multiplied by the volume index, and then divided by 100. For example, the total income terms of trade index is formed by multiplying the total terms of trade index by the volume index of total exports, and then dividing by 100,

$$itti(total)_t = [voli(exports)_t \times tti(total)_t] / 100.$$

Note on methodology

The methodology outlined here in Part I represents the procedures which were finally used. It should be noted, however, that a number of alternatives were considered and tried out. With respect to the methodology used to obtain a full data set, a number of different criteria for the inclusion or exclusion of certain groups of products, and alternative methods for imputing missing observations were considered and experimentation was undertaken to arrive at a final choice. This decision was, of course, influenced by both the need for as much accuracy as possible and the desire for the indices obtained to cover as much of the existent value of trade as possible.

Having experimented with indices which both exclude and include 'outlying' observations, it appears that in practice excluding outliers makes little difference to the series. However, in the end, we decided not to exclude outliers. The reason is that new high-tech goods can command a high price when they first appear on the market. Such goods could be subsumed under particular headings, and their appearance on the market would be reflected in a jump in the unit value of that heading. Excluding outliers often results in excluding the whole headings of products whose unit values fluctuate a lot. If such headings represent 'new' goods, excluding them from the index could bias the index downward.

With respect to the methodology used to obtain the indices, once again various alternatives were considered and examined before it became clear that the (Fisher chain index) method outlined above provided the most sensible indices, allowing as it does

for the weights applied to different categories to change over the period covered in a relatively smooth manner.

Part II. The Terms of Trade Facing South Korea with Respect to its Trade with LDCs

II.A Structure of South Korea's Trade with LDCs 1976-1995

In order to provide some background information to the study presented here, it is useful to look at the structure of, and pattern of changes in, South Korean trade with LDCs in the period under consideration. Table II.1, below, shows the proportion of South Korean exports to and imports from LDCs by value in each SITC 1-digit section, for five different years in the period 1976-1995, and across the whole period (overall). It may be noted that the first individual year for which the information is given is 1977, and not 1976. This is because, as will become clear later in the study, the first of the important link figures used in the construction of relevant unit value indices refers to 1977, and not 1976.

Table II.1

Proportion of South Korean trade with LDCs in each SITC 1-digit section 1976-1995 (% by value) and total value of trade ($ billion)						
Exports						
Year	1977	1980	1985	1990	1995	*Overall*
SITC 0	5.2	5.2	1.8	1.7	0.8	*1.5*
SITC 1	0.5	0.4	0.2	0.2	0.1	*0.2*
SITC 2	3.7	2.2	1.5	2.2	2.0	*2.0*
SITC 3	1.9	0.5	1.1	0.7	2.2	*1.9*
SITC 4	0.1	0.2	0.0	0.0	0.0	*0.0*
SITC 5	4.2	5.6	6.0	6.7	10.8	*8.0*
SITC 6	51.6	52.9	36.5	38.2	30.8	*37.0*
SITC 7	23.0	21.5	45.1	41.5	45.4	*41.6*
SITC 8	9.8	11.0	7.8	8.3	4.2	*6.7*
SITC 9	0.1	0.6	0.1	0.6	3.6	*1.2*
value $bill.	2.56	5.45	7.99	16.93	58.76	
Imports						
Year	1977	1980	1985	1990	1995	*Overall*
SITC 0	3.6	5.4	2.6	3.8	4.3	*5.1*
SITC 1	0.3	0.3	0.0	0.1	0.0	*0.1*
SITC 2	22.1	17.0	11.8	13.5	9.5	*12.8*
SITC 3	68.2	70.7	54.0	47.2	40.6	*48.9*
SITC 4	0.1	0.4	0.8	0.6	0.6	*0.6*
SITC 5	0.8	0.8	2.1	4.9	5.0	*3.6*
SITC 6	1.8	2.0	4.9	15.0	21.4	*14.0*
SITC 7	2.8	3.1	23.5	12.9	14.3	*12.5*
SITC 8	0.2	0.4	0.4	2.1	4.2	*2.2*
SITC 9	0.0	0.0	0.0	0.1	0.1	*0.1*
value $ bill.	2.95	7.58	9.22	15.38	39.04	

From Table II.1 it is clear that certain changes have occurred in the structure of South Korean trade with LDCs over the period under consideration. Whilst, overall, South Korean exports to LDCs have been dominated by SITC section 6 and 7 (basic

manufactures, and machinery and transport equipment, respectively), and South Korean imports from LDCs have been dominated by SITC sections 2, 3, 6 and 7 (crude materials excluding fuels, fuels, basic manufactures, and machinery and transport equipment respectively), the pattern of trade over time has altered significantly.

With respect to exports from South Korea to LDCs, it appears that, whilst the emphasis has remained on trade in SITC sections 6 and 7, there has been a gradual shift from a larger proportion of section 6 (basic manufactures) exports to a larger proportion of section 7 (machinery and transport equipment) exports. This is reflective of a South Korean shift into exports of manufactures the production of which requires a higher level of skill intensity. With respect to imports into South Korea from LDCs, there has also been a shift in emphasis. Manufactures (sections 6 and 7) imports have been expanding at the expense of imports of crude materials and fuel (sections 2 and 3). This might be indicative of a shift of LDC exports into basic manufactures away from traditional commodity and fuel exports. The sharp fall in petroleum prices after 1980 was a major reason for the decline in the share for section 3 (from 71% of imports in 1980 to 54% of imports in 1985). However, it is also possible that as South Korean industry (and exports) shifted towards skill-intensive manufactures, import demand for labour-intensive manufactures increased. Also there was a sharp recession in export unit values for section 6 in the first half of the 1980s - and consequently in the value exported of this section.

II. B Unit Value Indices and Terms of Trade Series

Unit value series for SITC 1-digit groups

Having followed the methodology outlined in Part I, the export unit value indices shown in the Table II.2 were obtained for SITC 1-digit groups 5 to 8, which constituted the large majority of all South Korean exports to LDCs.

Table II.2

Unit values indices for South Korean exports to LDCs 1976-1995 (1980=100)				
	SITC section			
	Section 5	Section 6	Section 7	Section 8
Year				
1976	66	68	78	72
1977	42	73	59	73
1978	70	82	79	77
1979	79	97	84	90
1980	100	100	100	100
1981	81	81	54	64
1982	71	96	116	93
1983	70	89	123	86
1984	71	92	110	89
1985	68	88	108	85
1986	66	91	115	91
1987	82	102	115	92
1988	100	109	87	92
1989	94	124	139	110
1990	94	124	139	114
1991	88	135	175	96
1992	85	137	137	114
1993	78	129	144	112
1994	88	129	139	106
1995	105	144	209	118

One important aspect of all indices constructed here is the extent to which they account for the trade which they are supposed to represent. Given the methodology outlined in Part A it is clear that some of the information present in the original data set is not used in the final data set used to calculate the indices. Moreover, it is also true that the value of trade accounted for in the 5-digit and 4-digit categories that form our original data set does not always add up to the total value of trade (assumed here to be equal to the total value of trade at the 1-digit level) for any given group. In addition, some of the final data set consists of estimated observations which can not be said to be part of the actual value of trade.

Thus some measure is needed to reflect the part of the value of trade which is included in the final data set from which the indices are calculated. This measure is calculated as value coverage,

where Value Coverage = (IV / TV) x 100 ,
where IV is the value from the original data set at the 4-digit and 5-digit level included in the final data set used to construct the index for a given group or aggregation,
and where TV is the total value at the 1-digit level for the given group or aggregation.

Obviously, value coverage can be calculated for any given group or aggregation across the whole sample 1976-1995 or for any given year. Table II.3 shows the level of value coverage for given years, and across the whole sample, for the indices shown in Table II.2. Once again, the first individual year for which the information (level of value coverage) is given is 1977, not 1976; the reason for this is the same as that outlined in

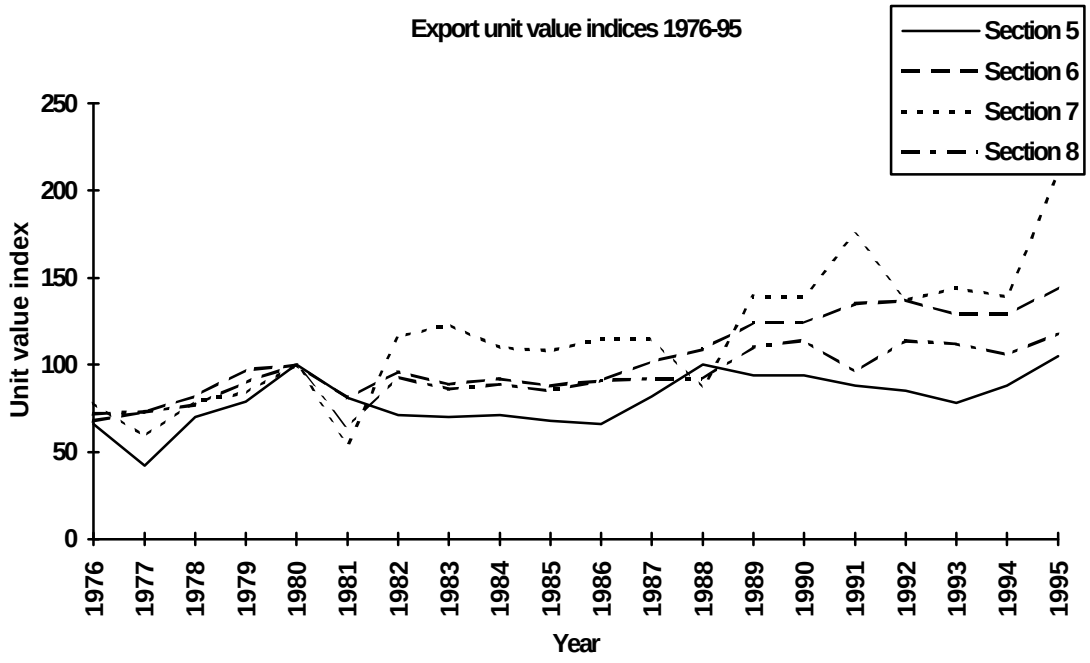
the introduction with respect to the data in Table II.1. This is the case for all the tables presenting value coverage information.

Table II.3

Value coverage of unit value indices for South Korean exports to LDCs (% by value)				
	Section 5	Section 6	Section 7	Section 8
Year				
1977	88.4	64.0	28.9	46.3
1980	88.5	77.0	57.5	49.7
1985	78.7	74.6	25.0	56.6
1990	67.5	73.4	48.9	73.4
1995	55.8	79.3	76.8	69.1
Overall	*61.7*	*72.4*	*52.6*	*56.0*

Bearing in mind that the overall coverage is over 50% for each index, Figure II.1 shows graphically the indices given in Table II.2.

Figure II.1



Unit value indices for some 1-digit SITC groups (those constituting the large majority of the trade in question) were also constructed for South Korean imports from LDCs. The results are shown in Table II.4.

Table II.4

Unit values indices for South Korean imports from LDCs 1976-1995 (1980=100)						
	SITC section					
	Section 2	Section 3	Section 5	Section 6	Section 7	Section 8
Year						
1976	50	39	38	63	54	20
1977	53	41	29	43	39	17
1978	53	42	73	74	58	87
1979	82	55	77	96	55	134
1980	100	100	100	100	100	100
1981	86	114	97	59	107	77
1982	78	110	90	78	105	225
1983	73	98	71	48	112	78
1984	79	96	62	78	126	104
1985	68	92	60	75	174	82
1986	65	52	63	77	68	95
1987	74	56	66	63	85	160
1988	75	50	78	92	74	861
1989	92	69	77	107	78	1361
1990	88	69	73	101	93	1259
1991	88	65	67	98	133	2162
1992	84	69	63	88	77	2002
1993	91	55	63	82	87	1995
1994	95	51	61	83	96	2598
1995	120	57	62	100	143	3640

These indices look reasonably sensible with the exception of that for Section 8. The unreasonable rise in the unit value index of section 8 probably reflects the shift to higher value items within individual headings of this section. If so, the section 8 index cannot be accepted as a valid indicator of the underlying trend in import prices. In order to investigate these indices further, their value coverage should be considered, and is presented in Table II.5.

Table II.5

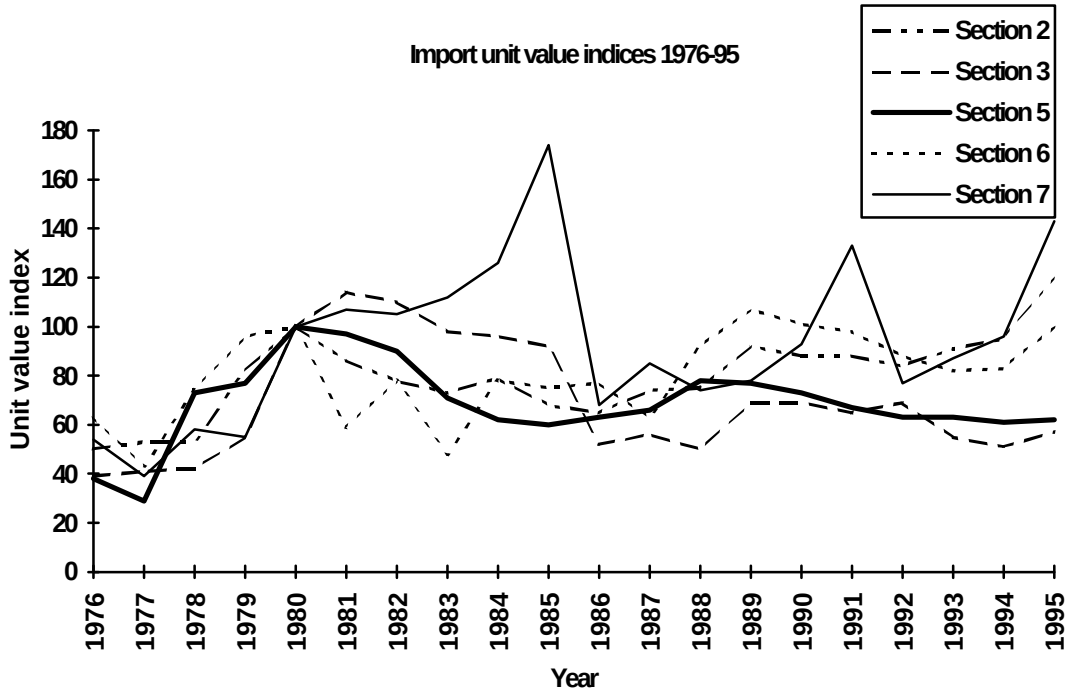
Value coverage of unit value indices for South Korean imports from LDCs (% by value)						
	Section 2	Section 3	Section 5	Section 6	Section 7	Section 8
Year						
1977	98.7	95.7	75.0	77.5	63.6	19.1
1980	97.2	94.4	44.1	80.8	32.0	17.4
1985	93.3	92.8	62.7	64.5	89.8	18.6
1990	68.0	0.1	25.6	26.9	29.6	21.5
1995	86.3	67.0	38.7	51.0	66.1	14.4
Overall	*80.7*	*65.9*	*39.7*	*39.9*	*42.1*	*14.3*

Evidently, there may also be a problem with the calculation of the unit value index for section 8 imports due to its very low value coverage (14.30%). In fact, if the value coverage for section 8 imports is considered year by year the picture becomes clearer; in only eight years in the sample 1976-1995 does the value coverage rise above 20%, and it drops below 10% in three years (2.22% in 1988, 1.81% in 1991 and 7.84% in 1994). As this low coverage seems to cause an unacceptable index, and also given that section 8 imports represent a very small part of South Korea's total imports from

LDCs (2.2% over the years 1976-1995), this index and section is not considered further.

Given that the overall coverage of the other indices is reasonable, Figure 2 shows graphically the indices given in Table II.4, with the exception of that for section 8.

Figure II.2



Aggregate unit value series

Unit value indices were also constructed for a number of aggregations for both South Korean exports to and imports from LDCs. The indices for aggregations of exports are given in Table II.6.

Table II.6

Aggregate unit value indices for South Korean exports to LDCs 1976-1995 (1980=100) and value of exports			
Aggregation	Manufactures	Total	Actual value
Sections by definition	5 to 8	0 to 9	($ billion)
Sections included in index	5 to 8	5 to 8	
Year			
1976	70	70	1.62
1977	67	67	2.56
1978	80	80	3.15
1979	92	92	3.91
1980	100	100	5.45
1981	69	69	6.94
1982	101	101	6.63
1983	97	97	7.01
1984	96	96	7.84
1985	93	93	7.99
1986	96	96	7.53
1987	104	104	9.64
1988	96	96	13.84
1989	126	126	14.87
1990	127	127	16.93
1991	142	142	25.32
1992	129	129	32.25
1993	128	128	37.62
1994	127	127	44.82
1995	166	166	58.76

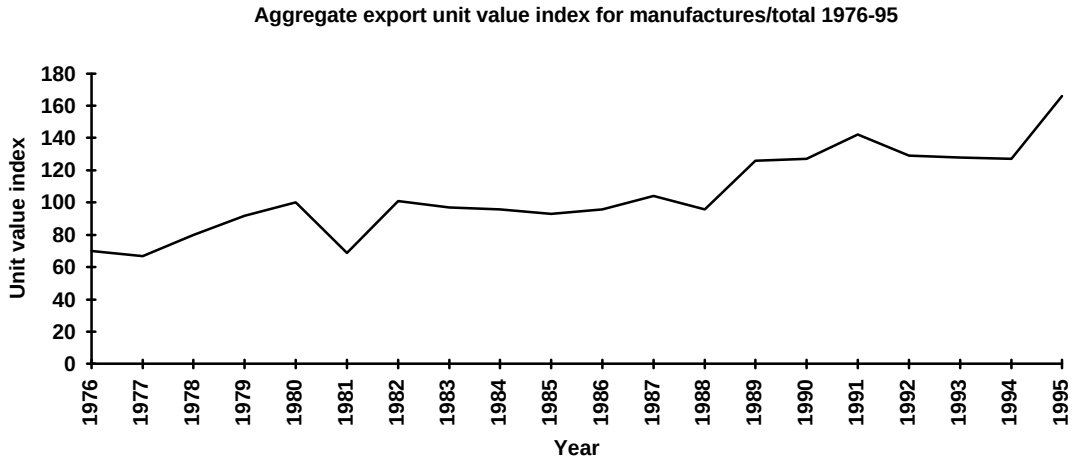
The level of value coverage of these indices is given in Table II.7.

Table II.7

Value coverage of aggregate unit value indices for South Korean exports to LDCs (% by value)		
	Manufactures	Total
Year		
1977	54.1	47.8
1980	69.8	63.5
1985	50.0	47.6
1990	62.3	59.0
1995	74.8	68.2
Overall	*61.5*	*57.4*

The indices presented in Table II.6 are shown graphically in Figure II.3.

Figure II.3



Unit value indices were also constructed for a number of aggregations for South Korean imports from LDCs. The indices for aggregations of imports are given in Table II.8. SITC section 8 imports were excluded from the calculations for the reasons outlined above.

Table II.8

Aggregate unit value indices for South Korean imports from LDCs 1976-1995 (1980=100)					
Aggregation	Commodities	Petroleum	Manufactures	Total	Total excluding petroleum
Sections by definition	0,1,2,4	3	5 to 8	0 to 9	0 to 2,4 to 9
Sections included in index	2	3	5 to 7	2,3,5 to 7	2,5 to 7
Year					
1976	50	39	47	41	48
1977	53	41	35	42	47
1978	53	42	64	45	55
1979	82	55	72	61	80
1980	100	100	100	100	100
1981	86	114	79	106	83
1982	78	110	91	102	81
1983	73	98	80	91	74
1984	79	96	99	95	86
1985	68	92	127	96	96
1986	65	52	69	59	66
1987	74	56	70	63	71
1988	75	50	82	63	77
1989	92	69	90	79	89
1990	88	69	95	80	90
1991	88	65	108	80	98
1992	84	69	77	74	76
1993	91	55	80	66	80
1994	95	51	84	65	84
1995	120	57	110	78	108

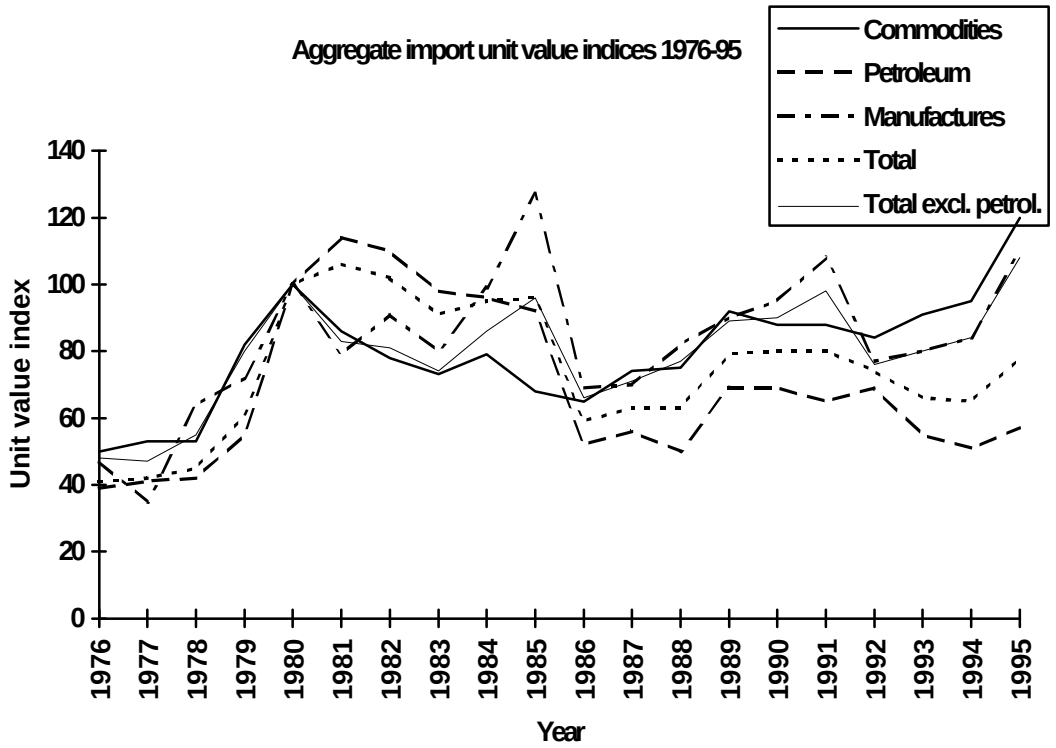
The level of value coverage of these indices is given in Table II.9.

Table II.9

Value coverage of aggregate unit value indices for South Korean imports from LDCs					
	Commodities	Petroleum	Manufactures	Total	Total excluding petroleum
Year					
1977	83.5	95.7	67.1	90.9	76.5
1980	71.8	94.4	46.8	86.2	66.5
1985	72.7	92.8	82.9	86.7	79.5
1990	51.1	0.1	26.1	18.3	34.5
1995	56.7	67.0	49.7	57.3	51.3
Overall	*55.5*	*65.9*	*38.0*	*54.8*	*44.2*

The indices presented in Table II.8 are shown graphically in Figure II.4.

Figure II.4



Terms of trade indices

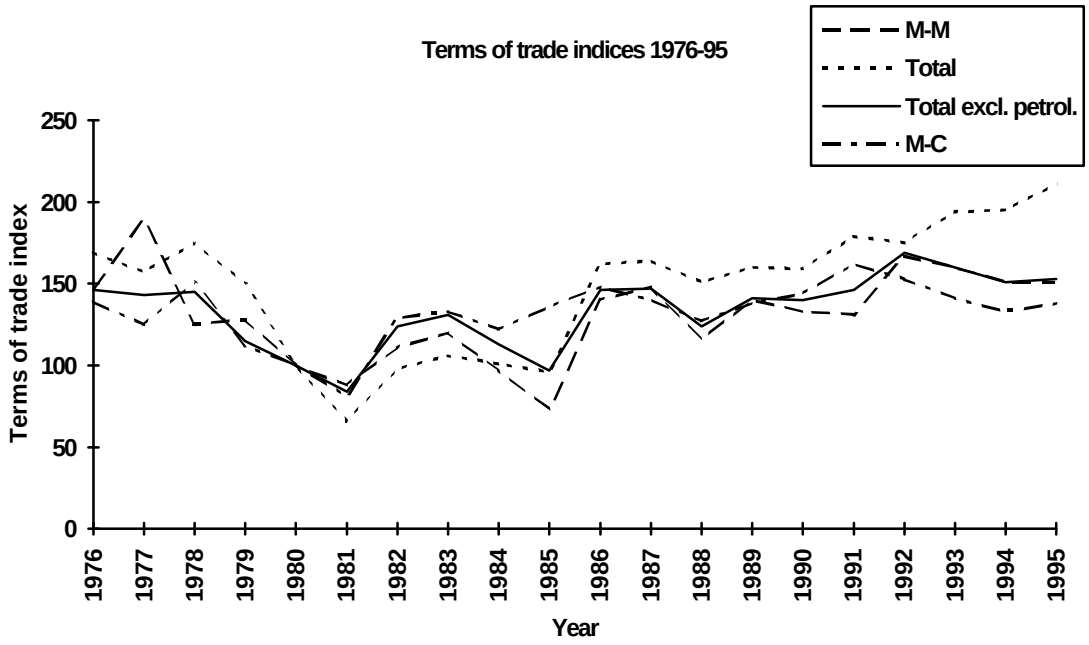
From the unit value indices presented above, a number of terms of trade indices were constructed following the methodology outlined in Part I. These terms of trade indices relate to the manufactures-manufactures, manufactures-commodities and total (including and excluding petroleum) terms of trade facing South Korea with respect to trade with LDCs, and are presented in Table II.10.

Table II.10

Terms of trade indices for South Korean trade with LDCs 1976-1995 (1980=100)				
Index	M-M	Total	Total (excluding petroleum)	M-C
Export index	Manufactures	Total	Total	Manufactures
Import index	Manufactures	Total	Total (excluding petroleum)	Commodities
Year				
1976	147	169	146	139
1977	189	157	143	125
1978	125	175	145	151
1979	128	150	115	112
1980	100	100	100	100
1981	88	66	84	81
1982	111	98	124	129
1983	120	106	131	133
1984	97	101	113	122
1985	73	96	97	136
1986	140	162	146	148
1987	148	164	147	140
1988	116	151	124	127
1989	140	160	141	138
1990	133	159	140	144
1991	131	179	146	162
1992	167	175	169	153
1993	160	194	160	141
1994	151	195	151	133
1995	151	211	153	138

With respect to the value coverage of these indices, the value coverage of the unit value indices used to construct them serve as a guide. The terms of trade indices themselves are presented graphically in Figure II.5.

Figure II.5



Income terms of trade

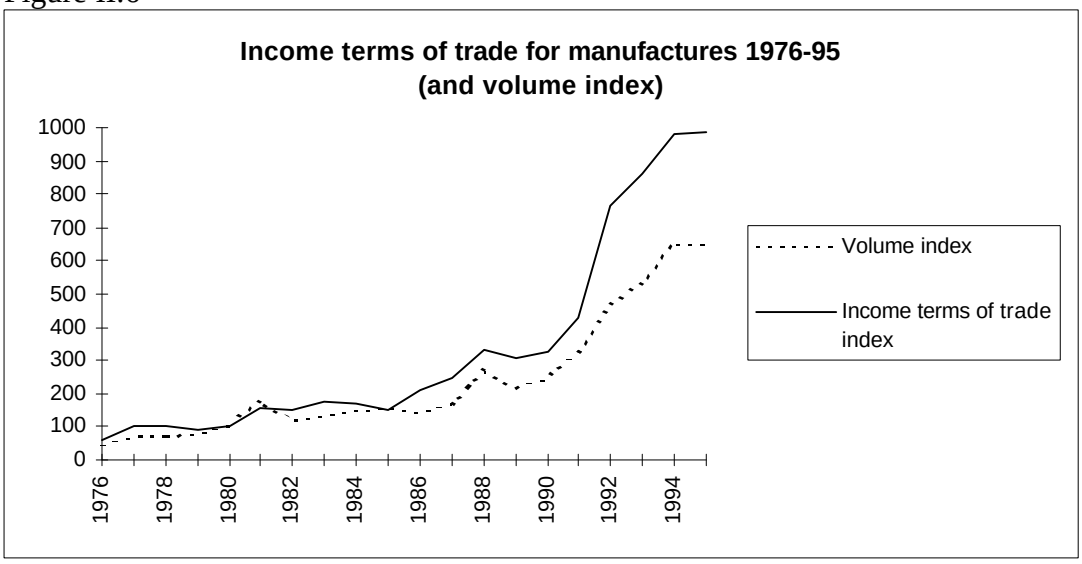
An income terms of trade index for manufactures was also constructed following the methodology outlined in Part I. Table II.11 presents this index as well as the volume index for South Korea's exports of manufactures to LDCs.

Table II.11

Volume index for exports and income terms of trade		
Index	Volume index (manufactures)	Income terms of trade index (for manufactures)
Year		
1976	43	63
1977	71	101
1978	73	105
1979	78	90
1980	100	100
1981	183	154
1982	121	150
1983	133	175
1984	150	168
1985	158	153
1986	144	210
1987	170	250
1988	266	329
1989	216	305
1990	246	327
1991	326	427
1992	459	767
1993	538	861
1994	650	982
1995	652	985

With respect to the value coverage of these indices, once again the value coverage of the unit value indices used to construct the terms of trade indices in question serve as a guide. The income terms of trade indices themselves are presented graphically in Figure II.6.

Figure II.6



II.C. Analysis of the Series

Introduction to analysis

Having obtained the indices presented in the above section, the next step was the analysis of those series. In order to discover trends in the terms of trade facing South Korea with respect to trade with LDCs, it is necessary to examine the indices to find out whether there exists any significant upward or downward trend in the indices. Therefore the indices were subjected to certain analytical procedures. The unit value indices were also tested in order to see if they exhibited any significant trend. To make the presentation of the results of this analysis clear, each series was given an abbreviated name as below.

UVXn : unit value index for SITC 1-digit group n exports
UVMn : unit value index for SITC 1-digit group n imports
UVXMAN : unit value index for manufactures exports
UVXTOT : unit value index for total exports
UVMCOM : unit value index for commodity imports
UVMPET : unit value index for petroleum imports
UVMMAN : unit value index for manufactures imports
UVMTOT : unit value index for total imports
UVMTEP : unit value index for total imports excluding petroleum
TTMM : manufactures-manufactures terms of trade index
TTT : total terms of trade index
TTTEP : total terms of trade index excluding petroleum

TTMC : manufactures-commodities terms of trade index
ITTT : total income terms of trade
ITTTEP : income terms of trade for manufactures

Methodology used to analyse series

In order to analyse the indices, having considered a number of alternatives, a dual approach was used. The first part of the approach is in line with the methodology used by Sapsford, Sarkar and Singer (1992) and also by Cuddington (1992), and offers a direct, simple approach. The natural logarithm series were firstly tested for unit roots using the Said-Dickey (1984) approach. As it occurred, in the case of every index the test statistic failed to reject the null hypothesis of non-stationarity at a 95% level of significance. Further testing specifically established these series as I(1). Thus it appears that the indices in question contain unit roots, that is are I(1), integrated of order one. As these indices were found to be non-stationary in levels and stationary in first-differences, it was appropriate to use the difference stationary (D-S) model to analyse them rather than the trend-stationary (T-S) model. In the case of indices which are found to contain no unit root, it is appropriate to use a different specification (the T-S model). Where no unit root is present, and the series is shown to be stationary, that is I(0), it is appropriate to use the trend stationary (T-S) model. Both the T-S and D-S models are outlined below.

The D-S model is based on the trend stationary (T-S) model as follows.

$\ln y_t = a + bt + e_t$ (T-S model)
where y_t is the index in question, t is time and e_t is an error term.

This implies that
$\ln y_{t-1} = a + b(t-1) + e_t$.

Therefore
$\ln y_t - \ln y_{t-1} = (a-a) + b[t-(t-1)] + e_t$
which simplifies to
$\Delta \ln y_t = b + e_t$ (D-S model)
where $\Delta \ln y_t = \ln y_t - \ln y_{t-1}$
and $A(L)\, e_t = B(L)\, u_t$
where L is the lag operator and u_t is i.i.d.

In the T-S model the coefficient for time represents the mean growth rate. In the D-S model the constant b represents the mean growth rate which is expressed in terms of percentage per annum when the index is in natural logarithms. With respect to the D-S model, shocks embodied in the innovations u_t may cause the growth rate temporarily to exceed or fall short of its mean rate. If shock effects die out over time, then the trend (represented here by the constant) represents the long-run phenomenon. If $\Delta \ln y_t$ is stationary then the constant represents the growth rate over time (interpreted as due to economic factors) after all cyclical movements (shocks) have been accounted for by the innovations term.

The second part of the approach follows the methodology introduced by Bleaney and Greenaway (1993), and offers a more complex time-series analysis taking into account the nature of the series in the calculation of the trend. They observe that if the natural logarithm of the index has a unit root it follows a random walk (possibly with drift) and does not in general revert to a trend, whilst if it has less than a unit root, it will revert to a trend. Thus they used the following specification.

$$\Delta \ln y_t = a + bt + \mu \ln y_{t-1} + e_t$$

If $\mu<0$ it describes an error correction model in which the change in $\ln y_t$ is negatively related to its current level. The error correction property of the model arises from the fact that if $\Delta \ln y_t$ is above its equilibrium value $\ln y^*$, then $\Delta \ln y_t$ will be lower than would otherwise be the case, and vice versa if $\Delta \ln y_t < \ln y^*$. If $\mu=0$, $\ln y_t$ describes a random walk with increasing variance over time. The closer μ is to -1, the faster $\ln y_t$ will converge towards its long-run trend. The long-run equilibrium solution to the model is

$\ln y = \alpha + \beta t$ $\Delta \ln y = \beta$

which gives $\beta = -b\mu^{-1}$

which is the implicit trend.

With respect to the nature of each index, Bleaney and Greenaway (1993) note that four distinct hypotheses exist, depending on the combination of the values of the estimated parameters b and μ. For both $b=0$ and $\mu=0$, or $b\neq0$ and $\mu=0$ the generating process of $\ln y_t$ is a random walk. When $b=0$ it has zero mean and a short memory, whilst when $b\neq0$ it has drift, so that its divergence from its equilibrium value depends on whether its sign is positive or negative. If $b=0$ and $\mu<0$, $\ln y_t$ has no long-term trend but tends to be pulled back towards its historical mean, the speed of the adjustment depending on the proximity of μ to -1. If $b\neq0$ and $\mu<0$, $\ln y_t$ reverts towards a non-zero long-run trend. Only in the cases where $\mu<0$ can the estimated equation be treated as a reliable guide to future trends in the index in question.

Results

Following testing for a unit root using the Said-Dickey approach, it was shown that all of the indices in question, in natural logarithm form, contained unit roots. The test results are given in the appendix.

Applying the first part of the approach to our indices for unit value and terms of trade, which all contained a unit root, the D-S model was used, and the results presented in Table II.12 were obtained.

Table II.12

Results from D-S model : $\Delta \ln y_t = b + e_t$			
Index (y_t)	b coefficient	t-value for b	Implied % change per annum in index
UVX5	0.024	0.517	2.42%
UVX6	0.040	1.831	4.00%
UVX7	0.052	0.733	5.17%
UVX8	0.026	0.687	2.59%
UVM2	0.046	1.382	4.63%
UVM3	0.020	0.370	1.97%
UVM5	0.025	0.441	2.51%
UVM6	0.024	0.354	2.41%
UVM7	0.051	0.616	5.08%
UVXMAN	0.046	1.215	4.57%
UVXTOT	0.046	1.215	4.57%
UVMCOM	0.046	0.033	4.63%
UVMPET	0.020	0.370	1.97%
UVMMAN	0.044	0.709	4.42%
UVMTOT	0.034	0.764	3.39%
UVMTEP	0.043	1.058	4.33%
TTMM	0.001	0.026	0.15%
TTT	0.012	0.233	1.18%
TTTEP	0.002	0.061	0.25%
TTMC	-0.001	-0.015	-0.05%
ITTT	0.155**	3.686	15.49%
ITTTEP	0.146**	3.275	14.56%

Note : ** indicates significance at the 99% level.

Evidently, the results of the D-S models give a varying range of implied percentage changes per annum for our indices. However, in terms of significance the results are largely weak as few of them appear to have a trend significantly different from zero. Only in the cases of the income terms of trade indices were the trends shown to be significant. Furthermore, the R^2 values for each of the D-S models were found to be very low, zero or close in every case.

The second part of the approach was then used. The results presented in Table II.13 were obtained.

Table II.13

Results from Bleaney and Greenaway method : $\Delta \ln y_t = a + bt + \mu \ln y_{t-1} + e_t$								
Index (y_t) (Nature of index)	a (t-val.)	b (t-val.)	μ (t-val.)	Implicit trend	Lagged dependent variables	R^2	Normality	Implied % change per annum in index
UVX5 (IV)	4.036** (4.222)	0.019** (3.331)	-0.973** (-4.280)	0.020	2	0.644	3.540	1.95%
UVX6 (IV)	2.501* (2.700)	0.018* (2.252)	-0.578* (2.646)	0.031		0.308	0.346	3.11%
UVX7 (IV)	5.332** (5.154)	0.062** (4.509)	-1.278** (-5.186)	0.049		0.631	2.268	4.85%
UVX8 (IV)	5.679** (5.629)	0.030** (4.417)	-1.326** (-5.611)	0.023		0.663	5.187	2.26%
UVM2 (II)	2.663* (2.773)	0.014 (1.766)	-0.640* (-2.746)	0.022	1	0.358	1.082	2.19%
UVM3 (IV)	4.629** (4.624)	-0.034* (-2.999)	-0.986** (-4.506)	-0.034	3	0.704	2.554	-3.35%
UVM5 (II)	2.391** (4.717)	-0.004 (-0.963)	-0.556** (-4.918)	-0.007	2	0.807	4.828	-0.72%
UVM6 (II)	4.265** (3.305)	0.015 (1.215)	-1.007** (-3.202)	0.015	1	0.548	3.395	1.49%
UVM7 (II)	2.524* (2.611)	0.016 (1.091)	-0.596* (-2.600)	0.027		0.297	0.524	2.68%
UVXMAN (IV)	4.819** (4.415)	0.042** (4.046)	-1.138** (-4.397)	0.037		0.549	0.228	3.69%
UVXTOT (IV)	4.819** (4.415)	0.042** (4.046)	-1.138** (-4.397)	0.037		0.549	0.228	3.69%
UVMCOM (II)	2.664* (2.773)	0.014 (1.766)	-0.640* (-2.746)	0.022	1	0.358	1.082	2.19%
UVMPET (IV)	4.629** (4.624)	-0.034* (-2.999)	-0.986** (-4.506)	-0.034	3	0.704	2.554	-3.35%
UVMMAN (II)	2.643* (2.899)	0.013 (1.108)	-0.627* (-2.830)	0.021		0.338	2.536	2.07%
UVMTOT (II)	4.818 (2.430)	-0.013 (-0.965)	-1.072* (-2.472)	-0.012	4	0.483	3.471	-1.21%
UVMTEP (II)	6.996** (3.462)	0.013 (1.431)	-1.624** (-3.424)	0.008	3	0.642	0.667	0.80%
TTMM (II)	2.808 (2.681)	0.011 (1.214)	-0.605* (-2.751)	0.018		0.332	2.901	1.82%
TTT (II)	2.036* (2.188)	0.021 (2.019)	-0.461* (-2.316)	0.046	1	0.318	2.597	4.56%
TTTEP (II)	2.832* (2.839)	0.013 (1.869)	-0.610* (-2.893)	0.021		0.356	0.423	2.13%
TTMC (II)	3.181** (2.967)	0.010 (1.590)	-0.676** (-2.994)	0.015		0.362	4.340	1.48%
ITTT (III)	1.420 (2.052)	0.079* (2.853)	-0.400 (-2.164)	0.198	2	0.481	2.640	19.75%
ITTTEP (IV)	2.164* (2.574)	0.083* (2.758)	-0.554* (-2.548)	0.150	1	0.360	0.751	14.98%

Note : * and ** indicate significance at the 95% and 99% level respectively.

The figures indicating the nature of the index in Table II.13 are representative of the following types.
(II) ln y_t has no long-term trend but tends to be pulled back towards its historical mean,
(III) ln y_t performs a random walk with drift,
(IV) ln y_t reverts towards a non-zero long-run trend.
Type (I) ln y_t performs a random walk with zero mean, is not evident here.
Lagged dependent variables were added in some cases to remove serial correlation. The normality test presented is the Bera-Jarque statistic which is distributed as a chi-square with two degrees of freedom. In all cases we find that the residuals are normal.

Evidently nine indices exhibit a non-zero long-run trend. These are the four one-digit export unit value series, the two aggregated export unit value series, the unit value series for petroleum imports (both in one-digit and aggregated form), and the total income terms of trade excluding petroleum. All these non-zero long-run trends are positive apart from those for the unit value series for petroleum imports. Twelve other indices appear to exhibit no long-term trend but tend to be pulled back to their historical mean. These are four one-digit import unit value series (excluding that for section 3 - petroleum), the import unit value series for the commodities, manufactures, total, and total excluding petroleum aggregations, as well as the four terms of trade series. One index, the total income terms of trade appears to display a random walk with drift. With regard to the implicit trends calculated, it appears that in every case except four the trend is positive. The four exceptions are the import unit value series for section 3, section 5, petroleum and total trade.

Interpretation of results

With respect to the results of the D-S models, it appears that the unit values of all the groups of exports and imports considered show a positive trend over the period 1976-95. The same can be said for the total, manufactures-manufactures, and total (excluding petroleum) terms of trade, and the two income terms of trade measures. Of these trends, only those in the income terms of trade indices are found to be significant. In these cases South Korea appears to have been facing improving terms of trade with respect to LDCs. Only the manufactures-commodities terms of trade facing South Korea appears to show a negative trend; this, whilst appearing to be a strange result in the light of expectations, is still very small (-0.05% per annum).

With respect to the results obtained using the Bleaney and Greenaway method, there are two issues to consider. The first is again the issue of the trend across the period. The second is the nature of each series in question. Once again, the majority of the indices appear to give a positive trend. The exceptions which give negative trends are the unit values for South Korean section 3/petroleum imports, for section 5 (chemical products) imports, and for total imports. Amongst the unit value series for groups of exports and imports, the export series appear to revert to non-zero long-run trends, whilst the import series appear to have no long-run trend but instead are pulled back towards their historical means (apart from section 3/petroleum imports which revert to a long-run non-zero trend).

Most important, with respect to this study, are the terms of trade indices. In the light of the results obtained from the Bleaney and Greenaway procedure, certain inferences can be made about these series. In the case of all four terms of trade indices calculated, a positive trend is implied. This ranges from a 1.48% increase per annum (in the case of the manufactures-commodities terms of trade facing South Korea) to a 4.56% increase per annum (in the case of the total terms of trade). However, the Bleaney and Greenaway method also reveals something of the long-run nature of each index. It appears that the four terms of trade indices have no long-term trend but tend to be pulled back towards their historical means.

Thus further interpretation of these results suggests that in general the terms of trade facing South Korea with respect to trade with LDCs increased across the period under consideration. It appears that the total terms of trade index was subject to the sharpest increase (4.56% per annum according to the Bleaney and Greenaway method, and 1.18% per annum using the D-S model), followed by the total terms of trade excluding petroleum (2.13% per annum and 0.25% per annum respectively), the manufactures-manufactures terms of trade (1.82% and 0.15% respectively) and the manufactures-commodities terms of trade (1.48% and a decrease of -0.05% respectively). However, with respect to long-run behaviour, it is suggested that these increases might not be part of a long-run trend. This, nonetheless, does not detract from the fact that, over the period considered here, the terms of trade facing South Korea generally faced an increasing trend.

With respect to the income terms of trade, the results from the Bleaney and Greenaway procedure also imply a positive trend, a 19.75% increase per annum in the case of the total income terms of trade, and a 14.98% increase per annum in the case of the income terms of trade for manufactures. The Bleaney and Greenaway method also reveals the former index to exhibit a random walk with drift, and the latter index to exhibit a significant long-run non-zero trend. It may be interpreted that the income terms of trade facing South Korea with respect to trade with LDCs clearly increased over the period under consideration. It appears that the total income terms of trade (including petroleum) was subject to a sharper increase than the income terms of trade excluding petroleum (19.75% per annum compared to 14.98% according to the Bleaney and Greenaway method, and 15.49% per annum compared to 14.56% using the D-S model). The results also clearly imply that the income terms of trade for manufactures form a significant long-run non-zero positive trend.

Conclusions regarding South Korea's Terms of Trade With LDCs

The results of this study enable us to answer certain questions with regard to the terms of trade between South Korea and LDCs in the period 1976-1995. They allow us to examine the trends in these terms of trade in line with the aims of this piece of work. Such an examination might also help us to form some hypotheses on the issue of the terms of trade between newly industrialising countries (NICs), such as South Korea and LDCs in general.

It seems clear that the measures of the terms of trade facing South Korea with respect to its trade with LDCs used here had a tendency to increase, or at least not decrease significantly, over the period under consideration. In order to draw some conclusions from this observation, however, it is necessary to examine each of our terms of trade measures individually.

Of the four measures of the terms of trade examined (total, total excluding petroleum, manufactures-manufactures and manufactures-commodities), it appears that the total terms of trade improved by the most in terms of average percentage change per annum. As it has been shown that, across the period, South Korean exports moved into products requiring higher levels of skill-intensity in production (machinery and equipment), whilst LDC exports moved from commodities and fuels into basic manufactures, this might be indicative, and also due to, prices of higher level manufactures increasing at a relatively quicker rate. However, it should be noted that a very substantial proportion of South Korean imports of manufactures from other LDCs comes from other NICs which are also operating at a more advanced technological level than some other LDCs. Thus whilst the data on the structure of South Korean trade shows a shift of imports from LDCs from commodities and fuels into basic manufactures across the period under consideration, it should also be borne in mind that firstly, some South Korean manufactures imports are higher-level manufactures originating in equally technologically developed NICs, whilst secondly, some South Korean manufactures imports of a basic nature may also have originated in equally technologically advanced NICs.

Returning to the four measures examined, it appears that the one which improved the least in average percentage per annum is the terms of trade facing South Korean exports of manufactures in return for imports from LDCs of commodities. On the surface this result seems somewhat incongruous given the hypothesis outlined above of a relatively high rate of increase in the price of South Korean (increasingly higher-level) manufactures exports. However, this can be explained by the fact that (contrary to some expectations) the unit value of South Korean commodity imports from LDCs appears to have increased at a higher rate than other imports, causing the manufactures-commodities terms of trade to improve at a relatively lower rate despite the shift of South Korean exports into increasingly higher level manufactures.

At a slightly higher rate of average percentage increase per annum stands the manufactures-manufactures terms of trade facing South Korea. The conclusions to be drawn from this are the same as those to be drawn from the increasing total terms of trade; South Korean manufactures exports increasingly shifted into higher-level manufactures of a more rapidly increasing price than the basic manufactures into which LDCs increasingly shifted. The same caveats explained above should once again be noted. The manufactures-manufactures terms of trade, however, increased at a lower rate per annum largely due to its omission of petroleum imports, the unit value of which appears to have fallen at a relatively high rate.

Finally, there is the measure of the total terms of trade excluding petroleum which appears to have increased at an average percentage per annum somewhat below that of the total terms of trade discussed above (largely due to the exclusion of petroleum for which the unit value of South Korean imports from LDCs declines relatively sharply)

but somewhat above that of the manufactures-commodities and the manufactures-manufactures terms of trade. From this increasing trend across the period under consideration in the total terms of trade excluding petroleum, it is possible again to conclude that the unit value of South Korean non-petroleum exports to LDCs increased more than the unit value of LDC non-petroleum exports to South Korea, as South Korean exports increasingly shifted into higher-price, higher-level manufactures compared to the basic manufactures into which LDC exports were increasingly shifting. Again, the same issues outlined above should be noted when considering this conclusion.

Turning to the income terms of trade facing South Korea with respect to its trade with LDCs, there appears to have been a big increase over the period under consideration whether petroleum is included in the calculation or not. The rate of increase appears to have been at a level very much higher than the (net barter) terms of trade. From this it can be concluded that, taking into account a huge increase in the volume of South Korean exports to LDCs over the period 1976-1995, South Korean purchasing-power in terms of trade with LDCs increased massively; the value of its exports in terms of its imports spiralled.

Such conclusions thus may largely support the view, that as newly industrialising countries move into exports of higher level manufactures, they will experience improving terms of trade with other LDCs which continue to export commodities and basic manufactures, just as the developed countries have in general experienced improving terms of trade with LDCs. In the specific case studied here, one NIC apparently shifting into exports of higher-level manufactures, clearly experiences improving terms of trade with LDCs shifting into exports of basic manufactures, across the period considered. In turn, this hypothesis might support the view that the terms of trade issue may be conceptualised in terms of strata, and that another group of LDCs, whilst experiencing declining terms of trade with NICs, might be able to improve the terms of trade it faces with respect to trade with other LDCs by shifting its exports into manufactures of an intermediate level of relatively higher-value and skill-intensity in production than the basic manufactures and commodities exported by LDCs in general. The idea of the stratification of trends in the terms of trade according to technological development has already been mentioned by Maizels, Palaskas and Crowe (1996). However, as noted above, such conclusions should also take into account the large proportion of South Korean manufactures imports from other equally technologically advanced NICs, be they higher-level or basic manufactures. This could imply that trends in the terms of trade might also depend on other factors influencing the nature of imports and exports, in addition to the technological development of the trading countries.

Part III. The Terms of Trade Facing South Korea with Respect to its Trade with DMEs

III.A. Structure of South Korea's Trade with DMEs 1976-1995

To provide an overview of the pattern of trade and changes in that pattern, Table III.1 presents South Korea's trade with DMEs at the 1-digit level for selected years.

Table III.1

Proportion of South Korean trade with DMEs by 1-digit (manufacturing) section (% by value) and total value of manufactured trade with DME					
Exports					
Year	1976	1980	1985	1990	1995
Section					
5	1	2	2	3	4
6	25	26	18	16	15
7	16	20	35	38	59
8	52	40	36	37	16
manufactures (5-8)	94	89	90	94	94
value ($ billion)	5.32	10.10	19.13	42.80	59.62
Imports					
Year	1976	1980	1985	1990	1995
Section					
5	13	13	13	12	11
6	18	16	15	14	13
7	36	34	42	43	46
8	4	5	6	7	10
manufactures (5-8)	71	68	75	77	80
value ($ billion)	4.44	9.34	14.96	38.82	74.45

The first point to note about the composition of South Korea's trade with DMEs is that it is heavily dominated by manufactures. This has been the case for the whole period under examination. However the composition of South Korea's trade in manufactures with DMEs, particularly the composition of South Korea's exports to DMEs, has changed quite dramatically during the period.

Composition of exports

In 1976, South Korea's exports of manufactured goods to DMEs exports were dominated by SITC 8. Together sections 6 and 8, generally described as basic or light manufactures, accounted for more than two thirds of South Korea's exports of manufactures to DMEs while machinery and transport equipment accounted for a modest 16%. Chemicals, section 5, accounted for a very small share of manufactured exports to DMEs throughout the period.

By 1995, the final year of the sample, the composition of South Korea's exports to DMEs had changed substantially. The share of light manufactures (SITC 6 and 8) accounted for about 30% while the share of machinery and transport equipment (SITC 7) rose to about 60%.

Although SITC sections 6 and 8 are referred to as light manufactures and section 7 is generally referred to as heavy or capital intensive manufactures, each one digit section contains a wide variety of goods (with respect to characteristics such as factor intensities and the types of markets in which they are sold). It is therefore instructive to examine the structure of South Korea's trade with DMEs at a somewhat more detailed level. Tables III.2 and III.3 show South Korea's main manufactured exports to DMEs at the start of the period (1976) and the end of the period (1995), classified at the 3-digit level. Both tables are followed by a description of the products listed in the tables.

Table III.2

South Korea's main exports of manufactures to DMEs (3-digit level) 1976	
SITC section	Share of manufactured exports to DMEs (% by value)
845 outer garments and other articles, knitted	7
851 footwear	7
842 outer garments, men's of textile fabrics	6
634 veneers, plywood, improved or reconstituted wood	5
844 undergarments of textile fabric	5
776 thermionic, cold and photocathode valves, tubes and parts	4
848 articles of apparel and clothing accessories, non textile	4
654 textile fabrics woven, other than cotton man made fibres	3
843 outer garments, women's of textile fabric	3
651 textile yarn	3
total	47

Table III.3

South Korea's main exports of manufactures to DMEs (3-digit level) 1995	
SITC section	Share of manufactured exports to DMEs (% by value)
776 thermionic, cold and photocathode valves, tubes and parts	18
781 passenger motor cars, for transport of passengers and goods	7
778 electrical machinery and apparatus n.e.s.	7
752 automatic data processing equipment	5
764 telecommunications equipment and parts	4
793 ships boats and floating structures	3
845 outer garments and other articles, knitted	2
674 universals, plates and sheets of iron and steel	2
653 fabrics, woven of man made fibres	2
851 footwear	2
total	52

Although even 3-digit headings contain a wide variety of goods, the composition of exports at this level of disaggregation gives some idea of the change taking place in the types of goods South Korea is exporting to DMEs. Tables III.2 and III.3 show that between 1976 and 1995, South Korea has moved away from exporting what are generally considered labour intensive basic manufactures (textiles, garments, footwear) into more skill and capital intensive exports such as automatic data processing equipment, cars, telecommunications equipment and other electronic equipment.

Composition of imports

The composition of South Korea's imports of manufactured goods from DMEs has not changed much during the period in question. The share of machinery and transport equipment increased 10% (as a share of total manufactured exports to DMEs) while the share of SITC 8 rose slightly and the share of SITC 6 fell slightly.

III. B Unit Value Indices and Terms of Trade Series

Unit value series for SITC 1-digit groups

This section presents and discusses the unit values for South Korea's trade with DMEs at the 1-digit level of SITC classification. It also reports on the coverage of these indices (i.e. how much of the total trade flow in that particular 1-digit heading is covered by the index). This section is divided into two subsections; the first examines manufactured exports to DMEs, the second, manufactured imports from DMEs.

Exports

Table III.4 shows unit value indices for South Korea's exports to DMEs at the 1-digit level.

Table III.4

Unit value indices for South Korean exports of manufactures to DMEs 1976-95 (1980=100)				
	SITC section			
year	SITC 5	SITC 6	SITC 7	SITC 8
1976	70	72	152	119
1977	68	78	171	124
1978	75	85	147	109
1979	88	100	81	99
1980	100	100	100	100
1981	149	102	120	87
1982	132	98	153	70
1983	123	91	182	48
1984	151	98	155	40
1985	132	97	161	28
1986	139	104	143	23
1987	163	113	146	21
1988	192	116	118	20
1989	188	135	174	16
1990	181	129	185	13
1991	184	125	213	9
1992	190	143	214	7
1993	184	146	204	4
1994	187	146	234	2
1995	205	155	318	1

Table III.4 shows that with the exception of SITC 8 all the unit value indices for exports at the 1-digit level rose. The export unit value index for SITC 8 is not satisfactory for a variety of reasons and has not been subject to further analysis. It is hoped that it is possible to improve the unit value index for SITC 8. The problem with SITC 8 and suggested remedies are discussed at the end of the appendix.

Compared to the other 1-digit export indices, the index for exports of SITC 7 rises relatively rapidly. Interestingly, section 7 is also the section where an increasingly larger share of South Korea's exports of manufactured goods to DMEs is concentrated.

Due to problems with missing values in the COMTRADE data (discussed in part I.), the 1-digit unit value series in table III.4 do not comprehensively cover the trade flow in question, i.e. products for which we did not have a sufficient number of observations are not included in the indices. Table III.5 reports on the value coverage for selected years, i.e. the share of the total trade flow covered by the products contained in the indices reported in table III.4.

Table III.5

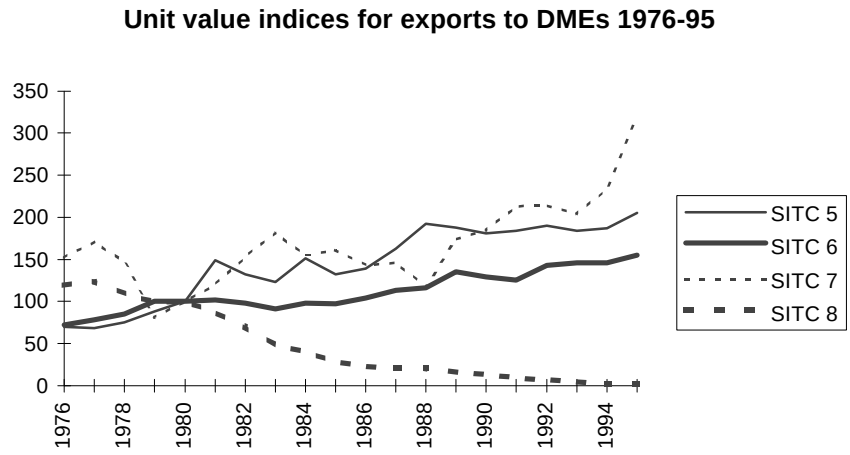
Value coverage of unit value indices for South Korean exports to DMEs (% by value)				
year	SITC 5	SITC 6	SITC 7	SITC 8
1976	85	67	76	45
1980	67	71	83	58
1985	75	76	88	57
1990	64	81	85	65
1995	63	75	80	55
*overall **	70	77	82	58

* simple unweighted average coverage of all years (1976-95)

The most notable feature of table III.5 is the low coverage of SITC 8 which is discussed at the end of the appendix. The coverage for the remaining 1-digit sections is generally satisfactory; the indices cover between 70 and 80 % of exports in each section.

In order to facilitate the comparison of the export unit value indices at the 1-digit level, the indices are presented graphically in figure III.1.

Figure III.1



As was clear from table III.4, the indices for exports of sections 5, 6 and 7 rise over the period, with section 7 rising more rapidly than the other two, particularly from 1988 onwards.

Imports

Table III.6 show the unit value indices for South Korea's imports of manufactured goods from DMEs at the 1-digit level.

Table III.6

Unit values indices for South Korean imports of manufactures from DMEs (1976-1995) (1980=100)				
	SITC section			
year	SITC-5	SITC-6	SITC-7	SITC-8
1976	51	65	58	49
1977	53	62	39	16
1978	63	83	78	29
1979	67	102	85	95
1980	100	100	100	100
1981	84	89	106	79
1982	85	104	115	101
1983	82	98	115	108
1984	83	103	105	116
1985	80	99	111	99
1986	79	96	128	144
1987	82	117	156	148
1988	100	140	137	152
1989	59	151	162	184
1990	106	134	168	189
1991	114	153	196	209
1992	111	135	204	223
1993	109	150	219	249
1994	113	153	231	285
1995	133	166	264	274

Table III.6 shows the import unit value of all 1-digit product groups rising, with section 7 and 8 rising faster than the others. The index for section 8 also fluctuates substantially, especially at the beginning of the period.

Table III.7 shows the coverage of the unit value indices reported in table III.6.

Table III.7

Value coverage of unit value indices for South Korean imports to DMEs (% by value)				
year	SITC-5	SITC-6	SITC-7	SITC-8
1976	90	77	52	13
1980	86	79	49	16
1985	86	74	41	16
1990	86	74	58	24
1995	80	77	53	18
*overall**	85	76	51	18

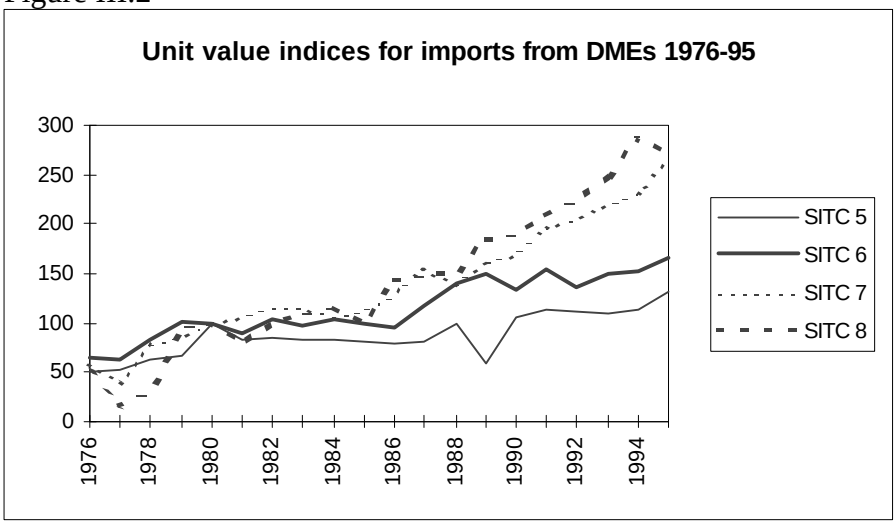
*simple unweighted average coverage of all years (1976-95)

The coverage for imports under headings 5 and 6 is satisfactory, covering between 75% and 90% of the relevant trade flow. However, the import coverage for SITC 7 is low, about 50% throughout the period. The coverage for SITC 8 is even more unsatisfactory. If the unit value series for all products within a one digit heading behave the same, a low value coverage could not lead to bias in the index. However, from examining individual products, we know that this is not the case, so we have no guarantee that the import unit value indices for section 7 and 8 reported in table III.7

reflect the true unit value index for imports of section 7 and 8. Ideas for how to improve the coverage for these two sections will be discussed in the appendix.

As with exports, the unit value indices for imports are presented in graphical form in figure III.2.

Figure III.2



Aggregate unit value indices and terms of trade

This section presents and discusses the aggregate unit value indices for manufactured goods for South Korea's exports to and imports from DMEs as well as the net barter terms of trade in manufactures with developed market economies. The section also includes an index for South Korea's income terms of trade (for manufactures only) with DMEs.

Table III.8 gives the export and import unit value indices and the net barter terms of trade for South Korea's trade in manufactures with DMEs

Table III.8

Unit value of manufactures exports, manufactured imports and manufacturing terms of trade			
year	exports of manufactures	imports of manufactures	terms of trade
1976	88	56	158
1977	94	45	210
1978	96	72	133
1979	87	85	103
1980	100	100	100
1981	111	94	118
1982	119	102	116
1983	125	100	125
1984	121	98	124
1985	119	98	121
1986	123	104	119
1987	126	121	104
1988	118	125	95
1989	153	113	135
1990	160	140	114
1991	171	159	108
1992	179	157	114
1993	177	167	106
1994	193	174	111
1995	241	197	122

Both the export and import unit values rise over the period in question. The net barter terms of trade fall between 1976 and 1980 and then rise slowly between 1988 and the end of the period. Particularly notable is a sharp rise in the NBTT index between 1976 and 77 and then a fall again after 1977. This could be due to a one off change in composition in one or more of the products (classified at the 5-digit level) or it could be a recording error in the data. It is unlikely that any real economic forces caused such a sudden jump in the index. The main source of the fluctuation appears to be the import unit value index which falls 10 points between 1976 and 1977 and then almost doubles between 1977 and 1978.[1]

The value coverage was calculated and is reported in table III.9

[1] . I hope to go back to the detailed data (5-digit level classification) to try and establish whether any one product or group of products are responsible for this jump in the index.

Table III.9

Value coverage of unit value indices for South Korean trade in manufactures with DMEs (% by value)		
year	exports	imports
1976	56	63
1980	68	61
1985	73	53
1990	76	62
1995	74	57

The coverage of the export unit value index is satisfactory as the index reflects the unit value movements of 70-75% of South Korea's exports to DMEs. However, the import unit value index is a little less satisfactory covering only about 60% of the value of South Korea's imports of manufactured goods from DMEs.

The aggregate export and import unit value indices are presented graphically in figure III.3, and the net barter terms of trade index for manufactures is presented in figure III.4.

Figure III.3

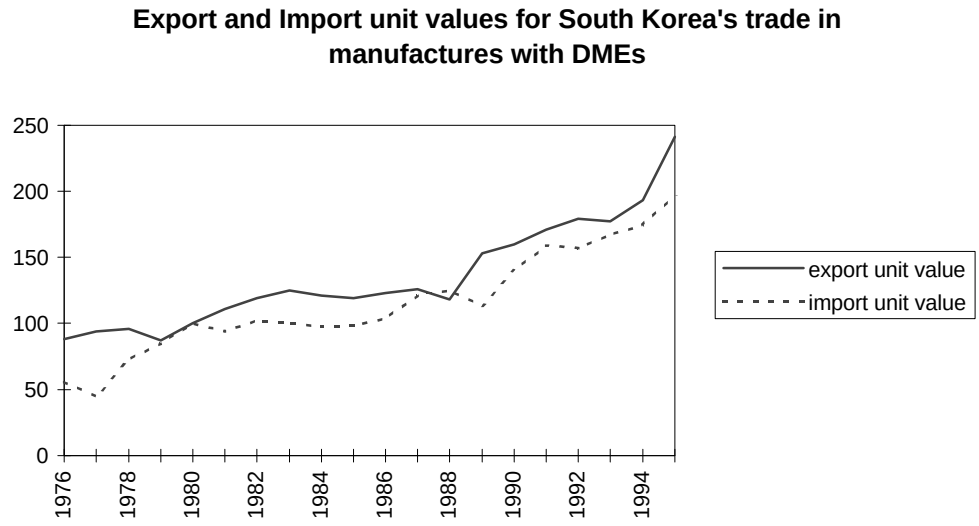
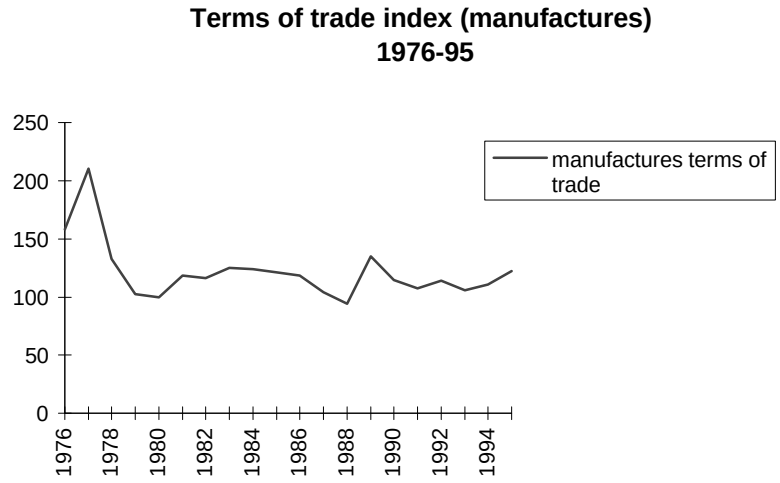


Figure III.4



Income terms of trade indices

Income terms of trade indices are constructed as follows

$$ITT_t = \frac{VI_t}{UVMMF}$$

where VI_t is the value index of South Korean exports of manufactures to DMEs, defined as

$$VI_t = \frac{\text{value of exports (t)}}{\text{value of exports (1980)}}$$

and UVMMF is the unit value index of manufactured imports from DMEs

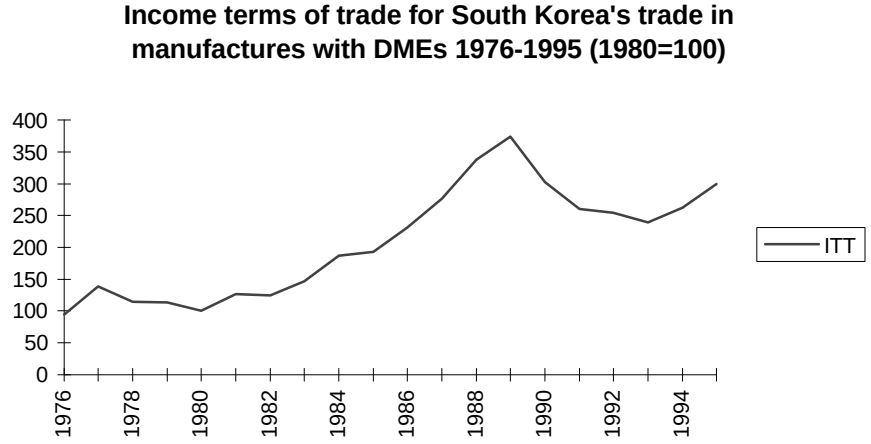
Table III.10 presents the volume index for South Korea's exports of manufactures to DMEs and also index for income terms of trade in manufactures.

Table III.10

Volume index for South Korea's exports of manufactures to DMEs and South Korea's income terms of trade in manufactures with DMEs 1976-95		
year	volume index	ITT
1976	60	95
1977	66	138
1978	86	114
1979	110	113
1980	100	100
1981	107	126
1982	107	124
1983	118	147
1984	151	187
1985	159	193
1986	194	231
1987	266	277
1988	358	338
1989	277	374
1990	265	303
1991	242	260
1992	223	254
1993	225	239
1994	237	263
1995	245	300

Table III.10 shows that the volume of manufactured exports to DMEs has risen rapidly over the period in South Korea. Moreover, South Korea's income terms of trade for manufactured goods rose over the period 1976-95, indicating that the value of exports, in terms of their purchasing power over imports, increased. However, looking more closely at the series as a whole there is indication of cyclical swings in the income terms of trade. These can be seen clearly in the graphical presentation of South Korea's income terms of trade in manufactures vis a vis developed market economies in figure III.5 below.

Figure III.5



III.C Analysis of the Series

This section applies econometric analysis to determine whether we can detect a significant upward or downward trend in the unit values, the net barter terms of trade and the income terms of trade for South Korea's trade with DMEs presented in the above section. The series are given the following abbreviations in the tables that follow in this section:

UVX5	- export unit value index for goods classified under SITC 5
UVX6	- export unit value index for goods classified under SITC 6
UVX7	- export unit value index for goods classified under SITC 7
UVX8	- export unit value index for goods classified under SITC 8
UVXMF	- export unit value index for total manufactures (SITC 5-8)
UVM5	- import unit value index for goods classified under SITC 5
UVM6	- import unit value index for goods classified under SITC 6
UVM7	- import unit value index for goods classified under SITC 7
UVM8	- import unit value index for goods classified under SITC 8
UVMMF	- import unit value index for total manufactures (SITC 5-8)
NBTTMF	- net barter terms of trade in manufactures
ITTMF	- income terms of trade for manufactures

Econometric Methodology

The econometric methodology is as described in Part II above.

Results

Following testing for a unit root using the Said-Dickey approach, it was shown that all indices (except that for SITC 8) contained unit roots. The test results are given in the appendix.

Applying the first part of the approach to our indices for unit value and the terms of trade, the D-S model was used and the results in table III.11 were obtained.

Table III.11

Results from the D-S model: $\Delta \ln y_t = b + e_t$			
index y_t	b coefficient	t-value for b	Implied % change per annum
UVX5	0.056	1.914	5.67
UVX6	0.04*	2.523	4.04
UVX7	0.039	0.754	3.9
UVX8			
UVM5	0.050	0.996	5.05
UVM6	0.049	1.747	4.93
UVM7	0.079	1.728	7.98
UVM8	0.091	0.931	9.06
UVXMF	0.053*	2.609	5.31
UVMMF	0.066	2.008	6.62
NBTTMF	-0.014	-0.328	-1.36
ITTMF	0.061	1.621	6.05

Note: * indicates significance at the 95% level

The D-S models give a varying range of implied percentage change for the indices in question. All of the export and import unit values show positive trends, as does the index for income terms of trade. The only negative trend is that for net barter terms of trade.

However, in terms of significance the results are weak as none of the trends, except that for exports of SITC 6 and total manufactured exports, are significantly different from zero. Moreover, the R^2 for the D-S models were low, close to 0 in all cases. This means that the implied percentage changes reported in table III.11 are rather unreliable.

The second part of the approach was then used. The results presented in table III.12 were obtained

Table III.12

Results from Bleaney and Greenaway Method: $\Delta \ln y_t = a + b_t + \mu \ln y_{t-1} + e_t$								
Index y_t (Nature of index)	a (t-value)	b	μ	Implicit trend	lagged dependent variable	R^2	Normality	Implied % change per annum
UVX5	1.731 (2.082)	0.017 (1.407)	-0.381 (-1.956)	0.0446		0.23	5.481	4.46%
UVX6 (IV)	2.282* (2.578)	0.017* (2.217)	-0.519* (-2.520)	0.0328		0.29	1.579	3.28%
UVX7 (IV)	2.302* (2.153)	0.026* (2.403)	-0.505* (-2.239)	0.0515		0.29	3.693	5.15%
UVX8								
UVM5 (IV)	3.649** (3.694)	0.029* (2.650)	-0.887** (-3.646)	0.0327		0.45	3.994	3.27%
UVM6 (IV)	2.799** (3.694)	0.027* (2.436)	-0.649** (-2.892)	0.0416		0.35	0.934	4.16%
UVM7 (IV)	3.444** (3.058)	0.057** (3.019)	-0.833** (-3.021)	0.0684	2	0.45	14.707	6.84%
UVM8 (IV)	4.801** (12.090)	0.098** (8.605)	-1.198** (-11.328)	0.0818			10.821	8.18%
UVXMF	2.185 (1.838)	0.025 (2.091)	-0.498 (-1.832)	0.0508		0.23	1.062	5.08%
UVMMF (IV)	2.781* (2.664)	0.0340* (2.616)	-0.662* (-2.638)	0.0514	1	0.37	4.543	5.14%
NBTTMF (II)	3.903** (5.185)	0.001 (0.137)	-0.826** (-5.424)	0.0008		0.56	0.738	0.08%
ITTMF (II)	1.982* (2.553)	0.031 (2.048)	-0.443* (-2.468)	0.0708	2	0.41	0.2.242	7.08%

Note: * and ** indicate significance at the 95% and the 99% level respectively

The figures indicating the nature of the index in table 12 are representative of the following types:
(I) ln y_t performs a random walk with zero mean
(II) ln y_t has no long run trend but tends to be pulled back towards its historical mean
(III) ln y_t performs a random walk with drift
(IV) ln y_t reverts towards a non-zero long run trend

Table 12 shows that seven of the unit value series exhibit a non-zero long run trend. Those are the unit value series for exports of SITC 6 and 7 and all the 1-digit unit value series for manufactured imports. The unit value series for total manufactured imports also exhibits a non-zero long run trend. However the series for total manufactured exports does not exhibit any significant trend (though the trend is significant at the 90% level).

Interestingly, the series for the net barter terms of trade for South Korea's terms of trade in manufactures with DMEs show no long run trend but tends to be pulled back towards a historical mean. This tendency is significant at the 99% level.

The income terms of trade index behaves in the same way as net barter terms of trade in that it reverts back to an historical mean, though this tendency is only significant at

the 95% level with respect to income terms of trade. With respect to income terms of trade, it was again not possible to establish a definite positive trend by the criteria used in the Table (the 95% level of significance).

Although the series exhibits no long run trend at the 95% level of significance, a positive trend can be established at the 90% level of significance. Visual inspection of figure III.5 also suggests a clear upward trend in income terms of trade. The evidence on whether there has been an upward trend in South Korea's income terms of trade with regard to its trade in manufactures with DMEs, is therefore somewhat inconclusive and depends critically on the choice between the 90% and 95% level of significance.

Conclusions regarding South Korea's Terms of Trade With Developed Market Economies

The above analysis allows us to make some comments on South Korea's terms of trade in manufactured goods with developed market economies.

Firstly, with respect to the net barter terms of trade, it appears that in the period for which we have data (1976-95) there was no significant trend, either upwards or downwards in Korea's net barter terms of trade with developed market economies. This result was obtained in both the simple difference stationary (D-S) model and the Bleaney and Greenaway approach.

Such a constant trend could arise in two ways. One possibility is that the unit values of Korea's exports of manufactures to DMEs was rising as fast as the unit values of her imports from DMEs.

Alternatively, a non-existent trend in the net barter terms of trade could arise even if the unit value of the individual products which comprise South Korea's exports to DMEs do not rise as fast as the individual unit values of its imports. The way in which this could come about is through a change in the composition of South Korea's exports of manufactures to DMEs. To illustrate, imagine that the unit value of South Korea's imports (using fixed weights, e.g. the 1976 pattern of trade) and exports (again using fixed weights) rise at the same rate. Provided the composition of trade does not change, the net barter terms of trade will remain constant. However, if the composition of South Korean manufactured exports to DMEs shift towards products whose unit value is rising faster than the average increase in the export unit value (as given by the rise in the constant weighted index), her net barter terms of trade will improve.

A cursory glance at tables III.1, III.2 and III.3 in this paper suggest that the composition of South Korea's terms of trade has changed quite dramatically over the period, and has shifted towards products that are considered more capital intensive and may be produced in less competitive markets, with less downward pressure on prices. This remains a rather tentative conclusion, but one which would be interesting to investigate further by examining the trends in the unit values of particular products

which feature or have previously featured as important in South Korea's trade with DMEs.

In summary therefore, the above evidence suggests that South Korea has not faced any significant detrimental terms of trade effects from her trade in manufactures with developed market economies. The positive (though marginally significant) trend in income terms of trade suggests that South Korea has increased the volume of exports to developed market economies to the point where the purchasing power of exports over imports has increased very markedly.

References

BLEANEY, M. and D. GREENAWAY (1993), "Long-run trends in the relative price of primary commodities and in the terms of trade of developing countries", Oxford Economic Papers, 45, 349-363.

CUDDINGTON, J.T. (1992), "Long-run trends in 26 primary commodity prices : a disaggregated look at the Prebisch-Singer hypothesis", Journal of Development Economics, 39, 207-227.

MAIZELS, A., T. PALASKAS and T. CROWE (1996), "The Prebisch-Singer hypothesis revisited", in D. Sapsford and J. Chen (eds.), Development Economics and Policy : Essays in Honour of Sir Hans Singer (Macmillan, forthcoming).

SAID, S.E. and D.A. DICKEY (1984), "Testing for unit roots in autoregressive moving average models with unknown order", Biometrica, 71, 599-607.

SAPSFORD, D., P. SARKAR and H. SINGER (1992), "The Prebisch-Singer terms of trade controversy revisited", Journal of International Development, 4, 315-332.

Appendix

This appendix reports the unit root tests underlying the models applied in sections II.C and III.C. It also contains a discussion of the coverage problem, and the problem with South Korea's trade in section 8 with DMEs

Testing for unit roots

As detailed, unit root tests were applied to the natural logarithms of the indices using the Said-Dickey approach. The test statistics obtained are given in Table A1 (for trade with LDCs) and A3 (for trade with DMEs). The null hypothesis in each case was that the series in question has a unit root. In each case a constant and a trend was included in the test regression which was of the form

$$\Delta \ln y_t = a + bt + c \ln y_{t-1} + e_t \quad .$$

Lagged dependent variables were added in some cases to remove autocorrelation in the residuals. The test statistic was the t-value for the coefficient c. The critical values, however, do not follow the usual t-value critical values.

Table A1

Results for unit root tests on series $\ln y_t$	
Index (y_t)	Test statistic
UVX5	-2.195
UVX6	-2.646
UVX7	-2.275
UVX8	-3.118
UVM2	-2.746
UVM3	-2.473
UVM5	-3.224
UVM6	-3.202
UVM7	-2.600
UVXMAN	-3.432
UVXTOT	-3.432
UVMCOM	-2.746
UVMPET	-2.467
UVMMAN	-2.472
UVMTOT	-2.943
UVMTEP	-3.424
TTMM	-2.751
TTT	-2.316
TTTEP	-2.893
TTMC	-2.667
ITTT	-2.164
ITTTEP	-2.548

Evidently, for each index, the null hypothesis of the presence of a unit root cannot be rejected. The series were then further tested at the first difference level against the null hypothesis of a unit root in the first differenced series. A constant and a trend were

only included where significant and lagged dependent variables were again included where necessary. Thus the test was of the form

$$\Delta^2 \ln y_t = c \, \Delta \ln y_{t-1} + e_t \quad .$$

The test statistics again are the t-values for the coefficient c and they are presented in Table A2.

Table A2

Results for unit root tests on series $\Delta \ln y_t$	
Index (y_t)	Test statistic
UVX5	-2.797**
UVX6	-4.240**
UVX7	-6.929**
UVX8	-5.119**
UVM2	-3.187**
UVM3	-3.388**
UVM5	-3.632**
UVM6	-3.277**
UVM7	-2.924**
UVXMAN	-3.317**
UVXTOT	-3.317**
UVMCOM	-3.187**
UVMPET	-3.388**
UVMMAN	-3.443**
UVMTOT	-3.128**
UVMTEP	-3.590**
TTMM	-5.554**
TTT	-3.949**
TTTEP	-4.625**
TTMC	-5.187**
ITTT	-2.960**
ITTTEP	-3.416**

Note : ** indicates significance at the 99% level.

Clearly the null hypothesis is rejected in each case. Thus the first differenced series are stationary, I(0) and do contain a unit root. This confirms, given the results in Table A1 that each of the indices is I(1).

Trade with DMEs

As detailed, unit root tests were applied to the natural logarithms of the indices using the Said-Dickey approach. The test statistics obtained for South Korea's trade with DMEs are given in Table A3 below.

Table A3

Results for unit root test on series $\ln y_t$	
index y_t	test statistic
UVX5	-1.956
UVX6	-2.520
UVX7	-0.835
UVX8	1.937
UVM5	-3.65
UVM6	-2.89
UVM7	-3.021
UVM8	-3.159
UVXMF	-1.856
UVMMF	-2.682
NBTTMF	-2.789
ITTMF	-1.487

** indicates significance at the 99% level

Table A3 shows that the null hypothesis of the presence of a unit root cannot be rejected. The series were then further tested at the first difference level against the null hypothesis of a unit root in the first differenced series. A constant and trend were only included where significant and lagged dependent variables were again included where necessary. The test was of the form

$$\Delta^2 \ln y_t = c\Delta \ln y_{t-1} + e_t$$

The test statistics are the t-values for the coefficient c and they are presented in table A4.

Table A4

Results for unit root test on series $\Delta \ln y_t$	
index y_t	test statistic
UVX5	-3.802**
UVX6	-3.497**
UVX7	-3.895**
UVX8	0.8175
UVM5	-6.671**
UVM6	-4.788**
UVM7	-8.842**
UVM8	-6.283**
UVXMF	-3.012**
UVMMF	-6.020**
NBTTMF	-5.612**
ITTMF	-4.057**

** indicates significance at the 99% level

The null hypothesis of non-stationarity is rejected in all cases except that for exports of section 8. For all other series, these results together with those in table A1 confirm that each index is I(1).

Note on coverage and on SITC section 8 (for South Korea's trade with DMEs)

Both the import and the export unit value series for section 8 has a low value coverage, and we can therefore not be sure whether the index accurately reflects the true unit value indices for trade in goods classified under SITC 8.

The index for exports of section 8 does not perform well (it collapses completely). Before conducting any analysis of this index, I will need to remedy that problem. By carefully examining the 5-digit level data, I discovered that a large number of products classified at the 5-digit level (under section 8), simply disappear (are not reported) after 1985. One possible remedy is to construct the index based on products classified at the 4 digit level (for those goods where the 5-digit level ceases to be reported after 1985).

It is important to improve the coverage of these indices, and hopefully to get a satisfactory index for exports of SITC 8. Obtaining an index for SITC 8 is particularly important since this section accounted for a very large share of South Korea's manufactured exports to DMEs at the beginning of the period under examination. If it is the case that the trend in the export unit value series of SITC 8 is different from the other 1-digit categories, the total index for manufactured exports may have behaved quite differently in the earlier years when SITC 8 constituted a large proportion of manufactured exports to DMEs.

The coverage of imports of SITC 7 is also unsatisfactorily low. This will also require a re-examination of the data to see whether it is due to a sudden 'disappearance' of certain products, as was the case with SITC 8.[2]

[2] . By disappearance I mean non-reporting. The fact that the value of exports of a particular product is 0 is not a problem.